



Epidemiological Response to Syndromic Surveillance Signals

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The epidemiological response to syndromic surveillance data must be tempered by the following considerations. It is not yet known how accurately either the syndromes themselves or the data used to define them predict or correlate with the target conditions/diseases under surveillance. In addition, because of the need for maximal sensitivity, the positive predictive value of an alarm signal for biological terrorism is by necessity going to be extremely low.¹ It is not known what the positive predictive value of a syndromic surveillance signal is for other naturally occurring conditions of public health importance. Finally, the statistical methods used to analyze and interpret syndromic surveillance data are new and have not been sufficiently evaluated under “real world” conditions to understand their usefulness in public health decision making.²

Nonetheless, syndromic surveillance makes intuitive sense to many epidemiologists, who believe that, as the science of syndromic surveillance evolves and matures, the value of such systems will become apparent. In King County, Washington, we conduct syndromic surveillance using computerized electronic emergency department and primary care clinic databases in the form of *International Classification of Diseases, 9th Revision (ICD-9)* codes and chief complaint data. Aberrations in the data trigger an epidemiological response when we detect an alarm signal corresponding to a statistically significant increase over expected observations based on baseline data using the quality control cumulative sums (CUSUM) methods and those displayed in the Early Aberration Reporting System (EARS) of the Centers for Disease Control and Prevention.³

Investigations are also initiated for any report of an otherwise notifiable condition or unexplained death. The first step in investigating an alarm is confirmation of the signal. We “drill down” and examine the individual cases comprising the cluster that triggered the alarm to obtain additional demographic and geographic data. In this way, we have detected system errors that include duplication of individual case data and improper coding at the clinical site. If the signal is real, the ensuing steps are designed to increase the specificity of the signal to the greatest extent possible. We evaluate the absolute number of events leading to the signal and, when possible, the proportion of cases from the reporting institution. In systems with relatively small populations and fewer observations, signals frequently correspond to a small increase in target conditions. Data on whether the patient was admitted or discharged are available, and investigations are more likely to

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ensue when admissions increase. In certain circumstances, we will observe for trends over time and act if cases increase, but not if the data promptly turn toward baseline.

The signal is validated using data from other surveillance systems that may help us interpret the emergency department and primary care syndromic surveillance data. Additional data sources include other sentinel surveillance systems (emergency medical system dispatch data, medical examiner death surveillance, and influenza sentinel provider data) as well as routine communicable disease surveillance data. At times, we attempt to validate a signal rapidly by using e-mail listserves to query emergency medicine, primary care, or infectious disease physicians about specific health conditions. Requesting additional diagnostic testing or interviewing clinicians at the reporting sites are additional ways to validate a signal. In situations when only a few observations have triggered an alarm, we may delay an investigation until the above steps have been carried out. Large-magnitude signals, persistent temporal trends, discrete geographic clustering of cases, and a concomitant increased threat level in the community all would be expected to increase the specificity of an alarm signal and, consequently, lower the threshold for additional epidemiological investigation.

The nature and magnitude of the event also influence the intensity of the epidemiological response. The level of investigation can vary from a phone call to a participating surveillance site to notification of internal and external response partners about a potential outbreak/event and dispatching a team to do chart review, interview clinicians, and possibly interview patients. Only through ongoing investigation of clusters of illness that trigger alarm signals will we learn about the ability of the system to detect events of public health importance that are not related to biological terrorism. Time and experience should also clarify whether earlier detection of naturally occurring illness clusters has any public health value. A well-defined and standardized epidemiological response will only be possible when improvements standardize methods for the collection, analysis, and interpretation of syndromic surveillance data.

REFERENCES

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